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## Editorial

# Advances in Multimedia Sensor Networks for Health-Care and Related Applications

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Multimedia sensor services and technologies play an important role in seamlessly providing and managing health, sports, and other services to anyone, everywhere, and anytime. Media sensors are usually equipped with cameras, microphones, and other devices that produce media content and services. Such services and technologies enable caregivers and related professionals to have immediate access to required information for efficient decision making. Since media sensing technology development is growing, many research opportunities are emerging in a broad spectrum of application domains.

Given the importance and timeliness of the topic, we organized this special issue with the objective of compiling the latest advancements and future research expectations in the related areas. After a thorough review process, this special issue now includes the following submissions which came from different countries of the world. All submitted papers followed the same standard (peer-reviewed by independent reviewers) as applied to regular submissions. We mention the gist of the contributions in this issue in the subsequent paragraphs.

In the article entitled “A Novel Study on Natural Robotic Rehabilitation Exergames Using the Unaffected Arm of Stroke Patients,” M. Hoda et al. designed and implemented an

FSR (Force Sensitive Resistor) glove for stroke patients who could not move their affected upper limb. The novelty of this glove is that it is to be worn on the unaffected hand that acts as a natural robotic arm during the rehabilitation session. The glove is equipped with FSR sensors that measure the forces exerted by the affected hand on the unaffected hand. The minimum the forces are, the more the work is done by the affected hand, and hence the patient is improving. A virtual reality exergame with audiovisual feedback has been implemented to motivate patients performing their rehabilitation exercises. The results were very encouraging. The clinical assessment indicated the feasibility of the proposed system with severely affected stroke patients.

In the survey paper entitled “Technologies and Research Trends in Wireless Body Area Networks for Healthcare: A Systematic Literature Review,” I. Ha studied the environmental characteristics of WBAN (Wireless Body Area Networks) and presented the potential research areas for developing more efficient WBAN by using the Systematic Literature Review (SLR) technique. In this study, the author investigates the environmental characteristics of WBAN that differ from conventional sensor networks. The environmental characteristics mean the specific characteristics of the wireless environment on the human body.

In the paper entitled “Heartbeat Biometrics for Remote Authentication Using Sensor Embedded Computing Devices,” M. S. Islam has proposed the use of heartbeat biometrics for its liveness property as a possible defense against spoofing attacks in remote authentication using sensor embedded mobile computing devices such as smart phones. Remote authentication is important for many applications such as distance health-care services and the proposed scheme offers more security, convenience, and robustness against noisy biometric input. This scheme should be feasible and increasingly important with the growing popularity of cloud and mobile computing.

In the paper entitled “POSOP: A DTN Routing Scheme for Information Connectivity of Health Centres in Hilly State of North India,” R. Johari et al. propose a DTN (Delay/Disruption Tolerant Network) routing algorithm considering a hilly region of North India that exploits all possible contact schemes of DTN to route the messages to the destination based on their specific type. The novelty of the idea lies in categorizing the health-care traffic type and utilizing the DTN contacts for specific traffic type. The authors presented the results based on simulations.

A. Dandashi et al. present in their paper, “Enhancing the Cognitive and Learning Skills of Children with Intellectual Disability through Physical Activity and Edutainment Games,” an exercise-based edutainment system to enhance the cognitive and learning skills of children with intellectual disability. The system consists of multimedia technology based games with a tangible user interface. As part of the learning process, the system uses a combination of Mayer’s Cognitive Theory of Multimedia Learning with a mild implementation of Skinner’s Operant Condition, incorporated with physical activity.

The paper “An Enhanced  $k$ -Means Clustering Algorithm for Pattern Discovery in Healthcare Data,” by R. A. Haraty et al., studies data mining applications in health care focusing on  $k$ -means clustering algorithm on large information of health-care datasets and presents an enhancement to  $k$ -means clustering that requires  $k$  or a lesser number of passes to a dataset. The proposed algorithm,  $G$ -means, utilizes a greedy approach to produce the preliminary centroids and then takes  $k$  or lesser passes over the dataset to adjust these center points. The experimental results show that  $G$ -means gives better results than  $k$ -means.

In the paper entitled “Multisensor Serious Game-Based Therapy Environment for Hemiplegic Patients,” M. A. Rahman presents an e-therapy framework that collects live therapeutic context by analyzing body joint data in a noninvasive way. Using the proposed framework, a therapist can model complex gestures by mapping them to a set of primitive gesture sequences and generate high-level serious game-based therapies. The author has developed scenarios to express a hemiplegic patient’s behavior into a set of trackable primitive gestures, which is validated through initial feedback from the therapists who have tested the developed system.

As understood from the above discussion, the selected papers in this special issue cover various aspects of the area. We hope that these would be very helpful for the researchers in finding new research directions.

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